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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2009*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,13-28,30-34,36-46 and 48-58* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11, 13-28, 30-34, 36-46, and 48-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All   b)☐ Some *   c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the

fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection.

Since this application is eligible for continued examination under 37 CFR 1.114,

and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the

previous Office action has been withdrawn pursuant to 37 CFR 1.114.

Applicant's submission filed on 12-June-2009 has been entered.

Remarks

2.   In response to communications filed on July 2, 2008, claims 1, 18, 36 and

56 have been amended, no new claims have been cancelled, and new claim 58

has been added. Therefore claims 1-11, 3-28, 30-34, 36-46 and 48-58 are

presently pending in the application.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for

all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or
> described as set forth in section 102 of this title, if the differences between the subject
> matter sought to be patented and the prior art are such that the subject matter as a whole
> would have been obvious at the time the invention was made to a person having ordinary
> skill in the art to which said subject matter pertains. Patentability shall not be negatived
> by the manner in which the invention was made.

4.   Claims 1-11, 13-17 and 57 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Milillo et al. (U.S. Patent No. 6,643,671) in view of Beal et al.

(U.S. Patent No. 6,253,295) [As disclosed in applicants "Information Disclosure

Statement" filed 2/20/2002], in further view of Mika et al. (U.S. Patent No.

6,189,079) [As disclosed in applicants "Information Disclosure Statement" filed

2/20/2002].

As to claim 1, Milillo et al. teaches (a) destaging from cache modified data

to a first volume at the primary site for a current database update and updating

one or more bits in a first bitmap at the primary site that indicate one or more

tracks on the first volume that are to be overwritten with the modified data, the

updating one or more bits being a first point in time virtual copy of the modified

data of the first volume to a second volume, wherein the first point in time virtual

copy updates the fist bitmap and no physical data is copied from the first volume

to the second (See column 2, lines 44-67; column 3, lines 1-33; column 8, lines

13-67; column 9, lines 1-5);

(b) transferring the first bitmap to a second bitmap at the primary site for

indicating the modified data that is to be transmitted to a third volume at the

remote site for the current database update (See column 4, lines 47-60; column

8, lines 42-60); and

(c) synchronizing the second volume with the third volume at the remote

site for the current database update by transmitting the modified data from either

the first or the second volume depending on the bit setting in the first bitmap, to

the third volume as indicated by the one or more bits in the second bitmap (See

column 2, lines 43-67; column 4, lines 47-60).

Milillo et al. does not teach a method for asynchronously transmitting one or more incremental database updates from a primary site to a remote site, the primary site and the remote site interconnected by at least one communication link; and performing a second point in time virtual copy of the modified data of the third volume to a fourth volume, which is at the remote site.

Beal et al. teaches a system and method for enabling pair-pair remote copy storage volumes to mirror data in another pair of storage volumes (See abstract), in which he teaches a method for asynchronously transmitting one or more incremental database updates from a primary site to a remote site, the primary site and the remote site interconnected by at least one communication link (See abstract, column 2, lines 53-67; column 3, lines 1-14); and performing a second point in time virtual copy of the modified data of the third volume to a fourth volume, which is at the remote site (See abstract; column 3, lines 27-33).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Milillo et al., to include a method for synchronously transmitting one or more incremental database updates from a primary site to a remote site, the primary site and the remote site interconnected by at least one communication link; and performing a second point in time virtual copy of the modified data of the third volume to a fourth volume, which is at the remote site.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Milillo et al., by the teachings of Beal et al. because a method for synchronously transmitting one or more

incremental database updates from a primary site to a remote site, the primary

site and the remote site interconnected by at least one communication link; and

performing a second point in time virtual copy of the modified data of the third

volume to a fourth volume, which is at the remote site would provide an improved

method and apparatus for transferring copies of directories of a PPRC virtual

volume pair to a second pair of co-located virtual volumes (See Beal et al.,

column 3, lines 5-8).

Milillo et al. as modified, does not explicitly teach the transferring including

at least inverting bits of the first bitmap to the second bitmap. Milillo et al. teaches

"write commands" however does not go into detail as to what or how those write

commands are applied so the examiner will show that inverting/changing bits in a

bitmap in order to indication modified data and transferring that information is

common.

Micka et al. data copy between peer-to-peer controllers (See abstract), in

which he teaches the transferring including at least inverting bits of the first

bitmap to the second bitmap (See column 6, lines 19-45).

Therefore, it would have been obvious to a person having ordinary skill in

the art at the time of the invention was made to have modified Milillo et al. as

modified, to include the transferring including at least inverting bits of the first

bitmap to the second bitmap.

It would have been obvious to a person having ordinary skill in the art at

the time the invention was made to have modified Milillo et al. as modified, by the

teachings of Micka et al. because the transferring including at least inverting bits

of the first bitmap to the second bitmap would prevent delays in response times

to the user (See <u>Micka et al.</u>, column 1, lines 50-67; column 2, lines 1-10).

As to claim 2, <u>Milillo et al.</u> as modified, teaches wherein the first bitmap

represents a FlashCopy bitmap and the second bitmap represents a peer-to-peer

remote copy (PPRC) bitmap (See <u>Milillo et al.</u>, column 1, lines 13-20; column 2,

lines 44-50, where "FlashCopy" is read on "snapshot").

As to claim 3, <u>Milillo et al.</u> as modified, teaches wherein the first point in

time virtual copy is achieved by flashcopying the modified data of the first volume

to the second volume (See <u>Milillo et al.</u>, column 2, lines 44-50; column 3, lines

21-30; column 7, lines 66-67; column 8, lines 1-9; column 9, lines 24-34).

As to claim 4, Milillo et al. as modified, teaches wherein the step of

flashcopying initializes the one or more bits in the first bitmap (See Milillo et al.,

column 2, lines 44-53, where "flashcopying" is read on "snapshot copy"; column

4, lines 47-60).

As to claim 5, Milillo et al. as modified, teaches wherein the second point

in time virtual copy is archived by flashcopying the modified data of the third

volume at the fourth volume (See Milillo et al., column 2, lines 44-53, where

"flashcopying" is read on "snapshot copy"; column 4, lines 47-60; column 8, lines

29-60).

As to claim 6, Milillo et al. as modified, teaches further comprising

providing an application host that is associated with the first volume for

performing the one or more incremental database updates (See Beal et al.,

abstract; column 3, lines 27-33; also see Milillo et al., column 1, lines 56-67;

column 2, lines 1-6); further comprising an application host that is associated with

the first volume for performing the one or more incremental database updates

(See Beal et al., abstract; column 3, lines 27-33; also see Milillo et al., column 1,

lines 56-67; column 2, lines 1-6).

As to claim 7, Milillo et al. as modified, teaches further comprising a

staggering the one or more incremental database updates during the current

database update (See <u>Beal et al.</u>, abstract; column 3, lines 27-33; also see <u>Milillo et al.</u>, column 9, lines 24-47); further comprising a means for staggering the one or more incremental database updates during the current database update (See <u>Beal et al.</u>, abstract; column 3, lines 27-33; also see <u>Milillo et al.</u>, column 9, lines 24-47).

As to claim 8, <u>Milillo et al.</u> as modified, teaches wherein staggering comprises:

determining whether a synchronization for a previous database update is complete after the destaging is preformed for the current database update (See <u>Beal et al.</u>, abstract; column 3, lines 27-33); and waiting for the synchronization of the previous database update to complete before the performing the first point in time virtual copy for the current database update (See <u>Beal et al.</u>, abstract; column 3, lines 27-33; also see <u>Milillo et al.</u>, column 1, lines 56-67; column 2, lines 1-6); wherein the means for staggering determines whether a synchronization for a previous database update is complete after the destaging is performed for the current database update (See <u>Beal et al.</u>, abstract; column 3, lines 27-33); and waits for the synchronization of the previous database update to complete before the transferring of the first bitmap to the second bitmap for the current database update (See <u>Beal et al.</u>, abstract; column 3, lines 27-33; also see <u>Milillo et al.</u>, column 1, lines 56-67; column 2, lines 1-6).

As to claim 9, Milillo et al. as modified, teaches initializing the first bitmap for a next database update after the performing the first point in time virtual copy for the current database update (See Milillo et al., column 2, lines 44-53; column 4, lines 47-60; column 8, lines 42-60, where "flashcopying" is read on "snapshot copying");and waiting for the next database update after the synchronizing for the current database update (See Beal et al., abstract; column 3, lines 27-33); wherein the means for staggering initializes the first bitmap for a next database update after the first means performs the point in time virtual copy for the current database update (See Milillo et al., column 2, lines 44-53; column 4, lines 47-60; column 8, lines 42-60, where "flashcopying" is read on "snapshot copying"); and waits for the next database update after the means for synchronizing synchronizes the second volume with the third volume for the current database update (See Beal et al., abstract; column 3, lines 27-33).

As to claim 10, Milillo et al. as modified, teaches wherein the synchronizing is achieved by establishing a peer to peer remote copy session between the second volume and the third volume for physically transmitting the modified data of the second volume over the at least one communication link to the third volume (See Beal et al., abstract; column 3, lines 27-33; also see Milillo et al., column 1, lines 35-48, lines 56-67; column 2, lines 1-6); wherein the means for synchronizing establishes a peer to peer remote copy session between the second volume and the third volume for physically transmitting the modified data of the second volume over the at least one communication link to the third

volume (See Beal et al., abstract; column 3, lines 27-33; also see Milillo et al.,

column 1, lines 35-48, lines 56-67; column 2, lines 1-6).

        As to claim 11, Milillo et al. as modified, teaches further comprising a

providing a controller at the primary site for managing access to both the first

volume and the second volume (See Beal et al., abstract; column 3, lines 27-33;

also see Milillo et al., column 3, lines 35-49; column 6, lines 53-67); and providing

a controller at the remote site for managing access to the third volume and the

fourth volume (See Beal et al., abstract; column 3, lines 27-33; also see Milillo et

al., column 3, lines 35-49; column 6, lines 53-67); further comprising means for

managing access to both the first volume and the second volume (See Beal et

al., abstract; column 3, lines 27-33; also see Milillo et al., column 3, lines 35-49;

column 6, lines 53-67); and means for managing access to the third volume and

the forth volume (See Beal et al., abstract; column 3, lines 27-33; also see Milillo

et al., column 3, lines 35-49; column 6, lines 53-67).

        As to claim 13, Milillo et al. as modified, initializing the first bitmap to

indicate that all data on the first volume is to be copied to the second volume and

all data that is copied to the second volume is to be copied to the third volume

(See Milillo et al., column 2, lines 44-53, lines 58-63; column 4, lines 47-60;

column 8, lines 42-60); means for initializing the first bitmap to indicate that all

data of the first volume is to be copied to the second volume and all data that is

copied to the second volume is to be copied to the third volume (See Milillo et al.,

column 2, lines 44-53, lines 58-63; column 4, lines 47-60; column 8, lines 42-60);

As to claim 14, Milillo et al. as modified, teaches further comprising

providing a recovery host that is associated with the forth volume for recovering

from a failure of the primary site by providing access to the forth volume (See

Milillo et al., column 8, lines 42-67, where "recovery host" is read on "recovery

operation"; column 10, lines 38-54).

As to claim 15, Milillo et al. as modified, teaches further comprising

automatically initiating the incremental database updates (See Milillo et al.,

column 15, lines 20-23); the system further comprising a means for automatically

initiating the incremental database updates (See Milillo et al., column 15, lines

20-23).

As to claim 16, Milillo et al. as modified, inspecting the one or more bits of

the first bitmap at the primary site to determine whether the second volume

includes data of the one or more tracks on the first volume that are to be

overwritten with the modified data (See Milillo et al., column 2, lines 44-53, lines

58-67); and performing a point in time virtual copy from the first volume to the

second volume of the data of the one or more tracks on the first volume that are

to be overwritten with the modified data if the first bitmap indicates that the

second volume does not include the data of the one or more tracks on the first

volume that are to be overwritten with the modified data (See <u>Milillo et al.,</u> column

2, lines 44-53; column 4, lines 47-60); means for inspecting the one or more bits

of the first bitmap at the primary site to determine whether the second volume

includes data of the one or more tracks on the first volume that are to be

overwritten with the modified data (See <u>Milillo et al.,</u> column 2, lines 44-53, lines

58-67); and means for performing a point in time virtual copy from the first

volume to the second volume of the data of the one or more tracks on the first

volume that are to be overwritten with the modified data if the first bitmap

indicates that the second volume does not include the data of the one or more

tracks on the first volume that are to be overwritten with the modified data (See

<u>Milillo et al.,</u> column 2, lines 44-53; column 4, lines 47-60).

As to claim 57, <u>Milillo et al.</u> as modified, teaches wherein the step of

performing includes performing a first point in time virtual copy of the modified

data of the first volume to a second volume at the primary site by updating the

first bitmap and transferring the first bitmap to a second bitmap at the primary site

for indicating the modified data that is to be transmitted to a third volume, which

is at the remote site, for the current database update (See <u>Milillo et al.,</u> column 2,

lines 44-53, lines 58-67; also see <u>Micka et al.</u> column 6, lines 19-45) and the step

of synchronizing includes synchronizing the second volume with the third volume

for the current database update by determining from the first bit map whether the

modified data of the second volume to be transmitted is located in the first

volume or the second volume and transmitting the modified data of the second

volume to the third volume as indicated by the one or more bits in the second

bitmap (See Milillo et al., column 2, lines 44-53, lines 58-67; See Micka et al.

column 6, lines 19-45).

5.   Claims 18-28, 30-33, 36-46, 48-51, 53-56, and 58 are rejected under 35

U.S.C. 103(a) as being unpatentable over Milillo et al. (U.S. Patent No.

6,643,671) in view of Beal et al. (U.S. Patent No. 6,253,295),

As to claim 18, Milillo et al. teaches a means for destaging modified data

to a first volume at the primary site for a current database update and updating

one or more bits in a first bitmap at the primary site that indicate one or more

tracks on the first volume that are to be overwritten with the modified data, the

updating one or more bits being a first point in time virtual copy of the modified

data of the first volume to a second volume, wherein the first point in time virtual

copy updates the fist bitmap without copying the modified data to the second

(See column 2, lines 44-67; column 3, lines 1-33; column 8, lines 13-67; column

9, lines 1-5);

first means for transferring the first bitmap to a second bitmap at the

primary site for indicating the modified data that is to be transmitted to a third

volume which is at the remote site for the current database update (See column

4, lines 47-60; column 8, lines 42-60); and

means for synchronizing the second volume with the third volume for the

current database update by transmitting the modified data of the second volume

to the third volume as indicated by the one or more bits in the second bitmap

(See column 2, lines 43-67; column 4, lines 47-60).

Milillo et al. does not teach a system for asynchronously transmitting one

or more incremental database updates from a primary site to a remote site, the

primary site and the remote site interconnected by at least one communication

link; and performing a second point in time virtual copy of the modified data of the

third volume to a fourth volume, which is at the remote site.

Beal et al. teaches a system and method for enabling pair-pair remote

copy storage volumes to mirror data in another pair of storage volumes (See

abstract), in which he teaches a system for asynchronously transmitting one or

more incremental database updates from a primary site to a remote site, the

primary site and the remote site interconnected by at least one communication

link (See abstract, column 2, lines 53-67; column 3, lines 1-14); performing a

second point in time virtual copy of the modified data of the third volume to a

fourth volume, which is at the remote site (See abstract; column 3, lines 27-33).

Therefore, it would have been obvious to a person having ordinary skill in

the art at the time of the invention was made to have modified Milillo et al., to

include a system for asynchronously transmitting one or more incremental

database updates from a primary site to a remote site, the primary site and the

remote site interconnected by at least one communication link; and performing a

second point in time virtual copy of the modified data of the third volume to a

fourth volume, which is at the remote site.

It would have been obvious to a person having ordinary skill in the art at

the time the invention was made to have modified Milillo et al., by the teachings

of Beal et al. because a system for asynchronously transmitting one or more

incremental database updates from a primary site to a remote site, the primary

site and the remote site interconnected by at least one communication link; and

performing a second point in time virtual copy of the modified data of the third

volume to a fourth volume, which is at the remote site would provide an improved

method and apparatus for transferring copies of directories of a PPRC virtual

volume pair to a second pair of co-located virtual volumes (See Beal et al.,

column 3, lines 5-8).

As to claims 2, 19 and 37, Milillo et al. as modified, teaches wherein the first

bitmap represents a FlashCopy bitmap and the second bitmap represents a

peer-to-peer remote copy (PPRC) bitmap (See Milillo et al., column 1, lines 13-

20; column 2, lines 44-50, where "FlashCopy" is read on "snapshot").

As to claims 20 and 38, Milillo et al. as modified, teaches wherein the first

point in time virtual copy is achieved by flashcopying the modified data of the first

volume to the second volume (See Milillo et al., column 2, lines 44-50; column 3,

lines 21-30; column 7, lines 66-67; column 8, lines 1-9; column 9, lines 24-34).

As to claims 21 and 39, Milillo et al. as modified, teaches wherein the step

of flashcopying initializes the one or more bits in the first bitmap (See Milillo et al.,

column 2, lines 44-53, where "flashcopying" is read on "snapshot copy"; column

4, lines 47-60).

As to claims 22 and 40, Milillo et al. as modified, teaches wherein the

second point in time virtual copy is archived by flashcopying the modified data of

the third volume at the fourth volume (See Milillo et al., column 2, lines 44-53,

where "flashcopying" is read on "snapshot copy"; column 4, lines 47-60; column

8, lines 29-60).

As to claims 23 and 41, Milillo et al. as modified, teaches further

comprising providing an application host that is associated with the first volume

for performing the one or more incremental database updates (See Beal et al.,

abstract; column 3, lines 27-33; also see Milillo et al., column 1, lines 56-67;

column 2, lines 1-6); further comprising an application host that is associated with

the first volume for performing the one or more incremental database updates

(See Beal et al., abstract; column 3, lines 27-33; also see Milillo et al., column 1,

lines 56-67; column 2, lines 1-6).

As to claims 24 and 42, Milillo et al. as modified, teaches further

comprising a staggering the one or more incremental database updates during

the current database update (See Beal et al., abstract; column 3, lines 27-33;

also see Milillo et al., column 9, lines 24-47); further comprising a means for

staggering the one or more incremental database updates during the current

database update (See <u>Beal et al.,</u> abstract; column 3, lines 27-33; also see <u>Milillo</u>

<u>et al.,</u> column 9, lines 24-47).

As to claims 25 and 43, <u>Milillo et al.</u> as modified, teaches wherein

staggering comprises:

determining whether a synchronization for a previous database update is

complete after the destaging is preformed for the current database update (See

<u>Beal et al.,</u> abstract; column 3, lines 27-33); and waiting for the synchronization

of the previous database update to complete before the performing the first point

in time virtual copy for the current database update (See <u>Beal et al.,</u> abstract;

column 3, lines 27-33; also see <u>Milillo et al.,</u> column 1, lines 56-67; column 2,

lines 1-6); wherein the means for staggering determines whether a

synchronization for a previous database update is complete after the destaging is

performed for the current database update (See <u>Beal et al.,</u> abstract; column 3,

lines 27-33); and waits for the synchronization of the previous database update

to complete before the transferring of the first bitmap to the second bitmap for the

current database update (See <u>Beal et al.,</u> abstract; column 3, lines 27-33; also

see <u>Milillo et al.,</u> column 1, lines 56-67; column 2, lines 1-6).

As to claims 26 and 44, <u>Milillo et al.</u> as modified, teaches initializing the

first bitmap for a next database update after the performing the first point in time

virtual copy for the current database update (See <u>Milillo et al.,</u> column 2, lines 44-

53; column 4, lines 47-60; column 8, lines 42-60, where "flashcopying" is read on

"snapshot copying");and waiting for the next database update after the
synchronizing for the current database update (See Beal et al., abstract; column
3, lines 27-33); wherein the means for staggering initializes the first bitmap for a
next database update after the first means performs the point in time virtual copy
for the current database update (See Milillo et al., column 2, lines 44-53; column
4, lines 47-60; column 8, lines 42-60, where "flashcopying" is read on "snapshot
copying"); and waits for the next database update after the means for
synchronizing synchronizes the second volume with the third volume for the
current database update (See Beal et al., abstract; column 3, lines 27-33).

As to claims 27 and 45, Milillo et al. as modified, teaches wherein the
synchronizing is achieved by establishing a peer to peer remote copy session
between the second volume and the third volume for physically transmitting the
modified data of the second volume over the at least one communication link to
the third volume (See Beal et al., abstract; column 3, lines 27-33; also see Milillo
et al., column 1, lines 35-48, lines 56-67; column 2, lines 1-6); wherein the means
for synchronizing establishes a peer to peer remote copy session between the
second volume and the third volume for physically transmitting the modified data
of the second volume over the at least one communication link to the third
volume (See Beal et al., abstract; column 3, lines 27-33; also see Milillo et al.,
column 1, lines 35-48, lines 56-67; column 2, lines 1-6).

As to claims 28 and 46, Milillo et al. as modified, teaches further

comprising a providing a controller at the primary site for managing access to

both the first volume and the second volume (See Beal et al., abstract; column 3,

lines 27-33; also see Milillo et al., column 3, lines 35-49; column 6, lines 53-67);

and providing a controller at the remote site for managing access to the third

volume and the fourth volume (See Beal et al., abstract; column 3, lines 27-33;

also see Milillo et al., column 3, lines 35-49; column 6, lines 53-67); further

comprising means for managing access to both the first volume and the second

volume (See Beal et al., abstract; column 3, lines 27-33; also see Milillo et al.,

column 3, lines 35-49; column 6, lines 53-67); and means for managing access

to the third volume and the forth volume (See Beal et al., abstract; column 3,

lines 27-33; also see Milillo et al., column 3, lines 35-49; column 6, lines 53-67).

As to claims 30 and 48, Milillo et al. as modified, initializing the first bitmap

to indicate that all data on the first volume is to be copied to the second volume

and all data that is copied to the second volume is to be copied to the third

volume (See Milillo et al., column 2, lines 44-53, lines 58-63; column 4, lines 47-

60; column 8, lines 42-60); means for initializing the first bitmap to indicate that

all data of the first volume is to be copied to the second volume and all data that

is copied to the second volume is to be copied to the third volume (See Milillo et

al., column 2, lines 44-53, lines 58-63; column 4, lines 47-60; column 8, lines 42-

60);

As to claims 31 and 49, <u>Milillo et al.</u> as modified, teaches further comprising providing a recovery host that is associated with the forth volume for recovering from a failure of the primary site by providing access to the forth volume (See <u>Milillo et al.</u>, column 8, lines 42-67, where "recovery host" is read on "recovery operation"; column 10, lines 38-54).

As to claims 32 and 50, <u>Milillo et al.</u> as modified, teaches further comprising automatically initiating the incremental database updates (See <u>Milillo et al.</u>, column 15, lines 20-23); the system further comprising a means for automatically initiating the incremental database updates (See <u>Milillo et al.</u>, column 15, lines 20-23).

As to claims 33 and 51, <u>Milillo et al.</u> as modified, inspecting the one or more bits of the first bitmap at the primary site to determine whether the second volume includes data of the one or more tracks on the first volume that are to be overwritten with the modified data (See <u>Milillo et al.</u>, column 2, lines 44-53, lines 58-67); and performing a point in time virtual copy from the first volume to the second volume of the data of the one or more tracks on the first volume that are to be overwritten with the modified data if the first bitmap indicates that the second volume does not include the data of the one or more tracks on the first volume that are to be overwritten with the modified data (See <u>Milillo et al.</u>, column 2, lines 44-53; column 4, lines 47-60); means for inspecting the one or more bits of the first bitmap at the primary site to determine whether the second volume

includes data of the one or more tracks on the first volume that are to be

overwritten with the modified data (See Milillo et al., column 2, lines 44-53, lines

58-67); and means for performing a point in time virtual copy from the first

volume to the second volume of the data of the one or more tracks on the first

volume that are to be overwritten with the modified data if the first bitmap

indicates that the second volume does not include the data of the one or more

tracks on the first volume that are to be overwritten with the modified data (See

Milillo et al., column 2, lines 44-53; column 4, lines 47-60).

As to claim 36, Milillo et al. teaches (a) destaging modified data to a first

volume at the primary site for a current database update and updating one or

more bits in a first bitmap at the primary site that indicate one or more tracks on

the first volume that are to be overwritten with the modified data, the updating

one or more bits being a first point in time virtual copy of the modified data of the

first volume to a second volume, wherein the first point in time virtual copy

updates the fist bitmap without copying the modified data to the second (See

column 2, lines 44-67; column 3, lines 1-33; column 8, lines 13-67; column 9,

lines 1-5);

(b) transferring the first bitmap to a second bitmap at the primary site for

indicating the modified data that is to be transmitted to a third volume at the

remote site for the current database update (See column 4, lines 47-60; column

8, lines 42-60); and

(c) synchronizing the second volume at the primary site with the third

volume at the remote site for the current database update by transmitting the

modified data from either the first volume or the second volume depending on bit

setting in the first bit map to the third volume as indicated by the one or more bits

in the second bitmap (See column 2, lines 43-67; column 4, lines 47-60).

Milillo et al. does not teach a program storage device, tangibly embodying

a program of instructions executable by a machine to perform a method for

asynchronously transmitting one or more incremental database updates from a

primary site to a remote site, the primary site and the remote site interconnected

by at least one communication link (See abstract, column 2, lines 53-67; column

3, lines 1-14); and (d) performing a second point in time virtual copy of the

modified data of the third volume to a fourth volume, which is at the remote site

(See abstract; column 3, lines 27-33).

.Beal et al. teaches a system and method for enabling pair-pair remote

copy storage volumes to mirror data in another pair of storage volumes (See

abstract), in which he teaches a program storage device, tangibly embodying a

program of instructions executable by a machine to perform a method for

asynchronously transmitting one or more incremental database updates from a

primary site to a remote site, the primary site and the remote site interconnected

by at least one communication link (See abstract, column 2, lines 53-67; column

3, lines 1-14); and (d) performing a second point in time virtual copy of the

modified data of the third volume to a fourth volume, which is at the remote site

(See abstract; column 3, lines 27-33).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Milillo et al., to include a program storage device, tangibly embodying a program of instructions executable by a machine to perform a method for asynchronously transmitting one or more incremental database updates from a primary site to a remote site, the primary site and the remote site interconnected by at least one communication link; and (d) performing a second point in time virtual copy of the modified data of the third volume to a fourth volume, which is at the remote site.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Milillo et al., by the teachings of Beal et al. because a program storage device, tangibly embodying a program of instructions executable by a machine to perform a method for asynchronously transmitting one or more incremental database updates from a primary site to a remote site, the primary site and the remote site interconnected by at least one communication link; and (d) performing a second point in time virtual copy of the modified data of the third volume to a fourth volume, which is at the remote site would provide an improved method and apparatus for transferring copies of directories of a PPRC virtual volume pair to a second pair of co-located virtual volumes (See Beal et al., column 3, lines 5-8).

As to claims 53-55, Milillo et al., as modified, teaches wherein during the synchronizing, the first volume is accessible to a host at the primary site, and the four volume is accessible to a host at the remote site (See Beal et al., abstract;

column 3, lines 27-33; also see Milillo et al., column 1, lines 56-67; column 2,

lines 1-6).

As to claim 56, Milillo et al., teaches a method for backing up data from a

primary site to a remote site (See column 2, lines 31-42) comprising;

(a) destaging modified data to a first volume at the primary site for a

current database update (See column 2, lines 44-53, lines 58-67);

(b) performing a first point in volume virtual copy of the modified data of

the first volume to a second volume at the primary site by setting a fist bitmap

without copying the modified data to the second volume (See column 2, lines 44-

67; column 3, lines 1-33; column 8, lines 13-67; column 9, lines 1-5);

(c) synchronizing the second volume with a third volume at the remote site

by transmitting the modified data from either the first or the second volume

depending on bit setting in the first bitmap to the third volume (See column 2,

lines 43-67; column 4, lines 47-60).

Milillo et al. does not teach a program storage device, tangibly embodying

a program of instructions executable by a machine to perform a method for

asynchronously transmitting one or more incremental database updates from a

primary site to a remote site, the primary site and the remote site interconnected

by at least one communication link; and (d) after completion of the synchronizing,

performing a second point in time virtual copy of the modified data of the third

volume to a fourth volume at the remote site.

Beal et al. teaches a system and method for enabling pair-pair remote

copy storage volumes to mirror data in another pair of storage volumes (See

abstract), in which he teaches a program storage device, tangibly embodying a

program of instructions executable by a machine to perform a method for

asynchronously transmitting one or more incremental database updates from a

primary site to a remote site, the primary site and the remote site interconnected

by at least one communication link (See abstract, column 2, lines 53-67; column

3, lines 1-14); (d) after completion of the synchronizing, performing a second

point in time virtual copy of the modified data of the third volume to a fourth

volume at the remote site (See abstract; column 3, lines 27-33).

Therefore, it would have been obvious to a person having ordinary skill in

the art at the time of the invention was made to have modified Milillo et al., to

include a program storage device, tangibly embodying a program of instructions

executable by a machine to perform a method for asynchronously transmitting

one or more incremental database updates from a primary site to a remote site,

the primary site and the remote site interconnected by at least one

communication link; (d) after completion of the synchronizing, performing a

second point in time virtual copy of the modified data of the third volume to a

fourth volume at the remote site.

It would have been obvious to a person having ordinary skill in the art at

the time the invention was made to have modified Milillo et al., by the teachings

of Beal et al. because a program storage device, tangibly embodying a program

of instructions executable by a machine to perform a method for asynchronously

transmitting one or more incremental database updates from a primary site to a

remote site, the primary site and the remote site interconnected by at least one

communication link; (d) after completion of the synchronizing, performing a

second point in time virtual copy of the modified data of the third volume to a

fourth volume at the remote site would provide an improved method and

apparatus for transferring copies of directories of a PPRC virtual volume pair to a

second pair of co-located virtual volumes (See Beal et al., column 3, lines 5-8).

As to claim 58, Milillo et al. as modified, teaches wherein the

synchronizing step further includes inspecting the first bitmap to determine

whether the modified data is on the first volume or the second volume (See

column 2, lines 43-67; column 4, lines 47-60; column 8, lines 29-67).

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for

all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or
> described as set forth in section 102 of this title, if the differences between the subject
> matter sought to be patented and the prior art are such that the subject matter as a whole
> would have been obvious at the time the invention was made to a person having ordinary
> skill in the art to which said subject matter pertains. Patentability shall not be negatived
> by the manner in which the invention was made.

7.   Claims 17, 34 and 52, are rejected under 35 U.S.C. 103(a) as being

unpatentable over Milillo et al. (U.S. Patent No. 6,643,671) in view of Beal et al.

(U.S. Patent No. 6,253,295), as applied to claims 1-11,13-16, 18-28, 30-33, 36-

46, 48-51 and 53-56 above, and further in view of Crockett et al. (U.S. Patent

No. 5,504,861).

As to claims 17, 34 and 52, Milillo et al. as modified, still does not teach

wherein the at least one communication link is comprises at least one of a

channel link; a T1/T3 link; a Fibre channel; and an ESCON link.

Crockett et al. teaches remote data duplexing (See abstract), in which he

teaches wherein the at least one communication link is comprises at least one of

a channel link; a T1/T3 link; a Fibre channel; and an ESCON link (See Crockett

et al., column 7, lines 6-20).

Therefore, it would have been obvious to a person having ordinary skill in

the art at the time of the invention was made to have modified Milillo et al., to

include wherein the at least one communication link is comprises at least one of

a channel link; a T1/T3 link; a Fibre channel; and an ESCON link.

It would have been obvious to a person having ordinary skill in the art at

the time the invention was made to have modified Milillo et al., by the teachings

of Crockett et al. because wherein the at least one communication link is

comprises at least one of a channel link; a T1/T3 link; a Fibre channel; and an

ESCON link would provide a method and apparatus for providing a real time

update of data consistent with the data at a primary processing location using

minimal control data, wherein the method and apparatus operates independently

of a particular application data being recovered, that is, generic storage media

based rather than specific application data based (See Crockett et al., column 2,

lines 49-55).

Response to Arguments

8.   Applicant's arguments filed on 12-June -2009, with respect to the rejected claims 1-11, 3-28, 30-34, 36-46 and 48-58 have been fully considered but they are not found to be persuasive:

In response to applicants' arguments regarding "***U.S. Patent No. 6,643,671 to Milillo et al ("Milillo") does not disclose or suggest the claims as amended. That is, Mililto does not disclose or suggest at least "destaging from cache memory to a first volume" and performing "a first point in time virtual copy wherein the first point in time virtual copy updates the first bitmap and no physical data is copied from the first volume,***" the arguments have been fully considered but are not found to be persuasive, because as previously argued by the examiner Milillo teaches the source volume receiving a series of write commands from a host and making a snapshot copy by establishing a bitmap with the updated write commands. A copy of the bitmap having the accumulated write commands is received by primary target volume from source volume. The Bitmap is then reset (updated) at the source volume in order to identify the next set of accumulated write commands (Se column 8, lines 13-67). Examiner believes this teaches updating the first bitmap as argued by the applicant.. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicants' arguments regarding "***Milillo also does not disclose or suggest at least, "synchronizing the second volume with the***

third volume for the current database update by transmitting the modified data from either the first volume or the second volume depending on bit setting in the first bitmap, to the third volume as indicated by the one or more bits in the second bitmap." For example, Milillo does not disclose or suggest at least to look to a "second bitmap" for indication of synchronization of the third volume with the second volume, and also to look to the first bitmap to determine where the data to be synchronized is, i.e., the first volume or the second volume," the arguments have been fully considered but are not found to be persuasive, because Milillo discloses "write" commands on the bitmaps to indicate synchronization (See column 4, lines 47-65).

Conclusion

8.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to MELLISSA M. CHOJNACKI whose telephone number is (571)272-4076. The examiner can normally be reached on 9:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Rones can be reached on (571) 272-4085. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from

the Patent Application Information Retrieval (PAIR) system. Status information

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free). If you would like assistance from a USPTO Customer Service

Representative or access to the automated information system, call 800-786-

9199 (IN USA OR CANADA) or 571-272-1000.

August 27, 2009
Mmc

/Charles Rones/
Supervisory Patent Examiner, Art Unit 2164